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Itcha-Ilgachuz Alternative Silvicultural Systems Project 1995–2005: Research Update

Introduction

The Itcha-Ilgachuz project was initiated in 1995 to test irregular shelterwood and group selection silvicultural systems that could be used to conserve northern caribou (*Rangifer tarandus caribou*) habitat while allowing timber extraction on the Chilcotin Plateau, in west-central British Columbia. Northern caribou are a key management species under the Cariboo-Chilcotin Land Use Plan, are blue-listed provincially, and are considered threatened under the federal *Species at Risk Act*. The Itcha-Ilgachuz is currently the largest caribou herd in British Columbia.

The Northern Caribou Strategy (part of the Cariboo-Chilcotin Land Use Plan) has identified 181 000 ha of winter range for modified harvesting options (Youds et al. 2002). The primary goal of the project is to maintain enough terrestrial and arboreal lichen (critical winter forage) within forest stands so that caribou continue to use them. Other parts of the research trial have focused on regeneration (planting and natural ingress), commercial mushrooms, breeding birds, microclimate, and long-term site productivity. The goal of this Extension Note is to provide an update on various aspects of the project.

Silvicultural Systems and Harvesting Treatments

The study area is located about 110 km northwest of Alexis Creek, B.C. (52°28´N, 124°43´ W). The study blocks occur in the Very Dry, Very Cold Montane Spruce (MSxv) and Very Dry, Cold Sub-Boreal Pine-Spruce (SBPSxc) biogeoclimatic subzones, and range in elevation from 1260 to

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1640 m. Lodgepole pine is the dominant tree species.

The trial was designed as a randomized block experiment with five replicate blocks of 60–80 ha. Each block was split into four units and randomly assigned four treatments. One treatment is no-harvest. There are two irregular group shelterwood (IGS) systems where 50% of the stand area is cut every 70 years in openings ranging from 20 to 30 m in diameter. These systems were developed for terrestrial lichen sites in order to provide partial shade for lichens in the harvested openings. Different harvesting methods distinguish the two treatments: stem-only (SO) and whole-tree (WT) harvesting. With stem-only harvesting, debris from topping and delimbing was left in the harvested openings to maintain long-term site productivity, but aggregated to minimize the impact on terrestrial lichens and plantable spots. Whole-tree harvesting is a common practice in the central interior of British Columbia; debris from topping and delimbing is piled and burned at the roadside. The third silvicultural system is a group selection (GS) system based on one-third area removal every 80 years, and openings of 15 m in diameter. This system was developed for sites with abundant arboreal lichens (about 15% of the winter range). It was stem-only harvested. The blocks were harvested in 1996. Four of the blocks were paired with clearcuts that were also whole-tree harvested.

Research Connection to Caribou Management Strategies

This project was conceived to provide managers with solutions to maintaining caribou habitat within managed forests. The initial results were instrumental in producing the forest management recommendations for the Cariboo-Chilcotin Land Use Plan, Northern Caribou Strategy (Youds et al. 2002). These recommendations have been accepted and constitute current management direction. All caribou within the Southern Mountains National Ecological Area, including the Itcha-Ilgachuz herd, have been designated as threatened under the federal Species at Risk Act. This requires recovery plans to be produced and implemented. Early in 2005 the West Central Caribou Recovery Implementation Group was established to produce a recovery plan for a meta-population of five herds, including the Itcha-Ilgachuz. The results of this research will be instrumental in the production of the recovery document. A member of our research team is on the recovery group facilitating the extension of research into management plans.

Topics with New Publications

Windthrow

The rate of windthrow was measured for 5.3 years post-harvest in partially cut lodgepole pine stands on the Chilcotin Plateau in west-central British Columbia. There were no significant differences in rates among irregular group shelterwood, group selection, and no-harvest treatments for live or dead trees. For live trees, rates were particularly low (0.04–0.18% per ha per year), therefore posing low risk from a timber or forest health perspective. In contrast, rates were higher for dead trees (1.4–2.3% per ha per year as a percentage of dead standing). Most mortality resulted from the mountain pine beetle in the early 1980s, which killed up to 20% of the trees. The harvesting systems, designed to maintain northern caribou habitat (as required by the Cariboo-Chilcotin Land Use Plan) do not aggravate windthrow.

Waterhouse, M.J. and H. M. Armleder. 2004. Windthrow in partially cut lodgepole pine forests in West-Central British Columbia. B.C. Min. For., Res. Br., Victoria, B.C. Extension Note 70.
http://www.for.gov.bc.ca/hfd/pubs/Docs/En/En70.htm

Microclimate

The Chilcotin Plateau has a harsh growing environment that can be modified through

partial cutting. Factors of particular importance are air and soil temperature, frost events, and snow-free dates. To examine the magnitude of the influence of partial cutting, three pairs of climate stations were set up in partial cuts and clearcuts, across a range of elevations. Over the 7-year sample period, severity and number of frosts were substantially reduced in the partial cuts compared to clearcuts; however, soil temperature and soil temperature index (STI) were lower in partial cuts than in the nearby clearcuts. Mean growing-season (15 cm) soil temperatures were less than 10°C at all locations, with clearcuts being 1.5–1.9°C warmer than nearby partial cuts. Snow-free dates occurred approximately 1 month later at the highest-elevation site (1620 m) in comparison to the lowest site (1290 m). This difference lowered soil temperatures and shortened growing seasons at the highest site. Heavier snowpacks virtually eliminated soil freezing at the highest site. The study also compared north-edge, centre, and south-edge microsites within one 30-m opening on each of three partial cuts. The north edge (south aspect) was the most favourable microsite for seedling growth in the partial cuts, with the highest soil temperatures, earlier snow-free dates, and more solar irradiance.

Sagar, R.M., M.J. Waterhouse, and B. Chapman. 2005. Microclimate studies in silvicultural systems on the Chilcotin Plateau of British Columbia: The Itcha-Ilgachuz project (1997–2003). B.C. Min. For., Res. Br., Victoria, B.C. Tech. Rep. 22. http://www.for.gov.bc.ca/hfd/pubs/Docs/Tr/Tr022.htm

Planted stock

Fifth-year survival and growth results indicate that either lodgepole pine or interior spruce seedlings could adequately regenerate the small openings created by partial cutting. Survival of pine in the partial cuts was comparable to that in the clearcuts. Pine height and height growth were similar among treatments; however, diameters were significantly larger in the clearcuts, where there is increased light and warmer soils. Spruce survival varied between the clearcuts (35–98%) but was more consistent in the partial cuts (66–97%). Total height and height growth differed significantly among treatments, with the shortest spruce seedlings found in the clearcuts. Height reduction was attributed to severe frost damage. Seedling diameter did not differ among treatments. In caribou habitat, species should be planted in proportions similar to the pre-harvest stand composition to avoid potential impacts on the terrestrial and arboreal lichens.

Daintith, N. M., M.J. Waterhouse, and H.M. Armleder. 2005. Seedling response following partial cutting in lodgepole pine forests on caribou winter range in west-central British Columbia. Forestry Chronicle 81: 409–417.

Natural regeneration

This study compared pine natural regeneration density and height growth between the harvesting treatments and biogeoclimatic subzones. Density of post-logging ingress stems was higher on the SBPSxc blocks (5300–7850 stems/ha) than on the two higher-elevation MSxv blocks (1500–2400 stems/ha). On the SBPSxc blocks, regeneration density was similar to density on adjacent clearcuts. In the MSxv, however, natural regeneration density was significantly less on the partially harvested blocks than on an adjacent clearcut. Reduced natural regeneration density on MSxv blocks may be due to thicker forest floors and lower growing-season temperatures at high elevations. These results indicate that small openings in the SBPSxc can be naturally regenerated by lodgepole pine without post-logging site preparation, but that higher-elevation blocks in the MSxv will need to be planted to ensure full stocking by lodgepole pine within 7 years. Due to the relatively long period between harvest entries on these caribou winter range blocks, a regeneration

delay longer than 7 years may have little effect on subsequent timber harvests.

O.A. Steen, M.J. Waterhouse, H.M. Armleder, and N. Daintith. 2005. Natural regeneration of lodgepole pine following partial harvesting on northern caribou winter range in west-central British Columbia. In progress for publication.

Preview of Upcoming Publications and Issues

Breeding birds

Breeding birds were surveyed 1 year pre-harvest (1995) and for 4 years post-harvest (1996–2001) to measure the impact of partial cutting in old lodgepole pine forests on the Chilcotin Plateau of British Columbia. The silvicultural systems recommended to manage northern caribou habitat did not negatively affect the breeding bird community, and some species increased in abundance in some years. A scientific journal article is being prepared.

Lichens

Terrestrial and arboreal lichens were measured pre-harvest (1995) and three times post-harvest (1998, 2000, and 2004). In 1998, edible terrestrial lichen abundance in the partial cuts decreased by 45–56% compared to the no-harvest treatment. The largest reduction was in the irregular group shelterwood stem-only treatment. In addition to increased light, the slash from the on-site processing buried some of the lichen. The 2004 assessment indicates that there has been some lichen recovery (particularly in the group selection treatment) but, in the shelterwood treatments, lichen is still 33–40% lower than in the no-harvest treatment. A scientific journal article is being prepared.

Fungi

Pine mushrooms, black morels, and truffles have been sampled over several post-treatment years. Also, some rare species have been documented. A Ministry of Forests Extension Note is being prepared.

Long-term site productivity

The objective of this study is to evaluate impacts of woody debris loading levels on sustainability of site productivity. Preliminary analysis continues to show that woody debris plays a positive role in establishment and growth of planted seedlings. A scientific journal article will be prepared after the 2005 field season.

Mountain pine beetle

In 2004, block one (lowest elevation) in the trial had a high level of current attack (20%) by pine beetle (notably 57% in the no-harvest treatment), but the other four blocks had lower amounts (3–16%). The pine beetle could rapidly expand throughout the area over the next couple of years. There may be serious implications to caribou and other wildlife as their habitat is modified to mostly standing dead trees and various salvage scenarios. The research trial will measure the long-term impacts of habitat change caused by pine beetle on caribou habitat and biodiversity.

Previous Publications

Armleder, H., M. Waterhouse, D. Laurie, C. Schmid, B. Hansen, and J. Young. 1996. Silvicultural systems for lodgepole pine and northern caribou. B.C. Min. For., Cariboo Forest Region, Extension Note 19. http://www.for.gov.bc.ca/rsi/research/cextnotes/extnot19.htm

Miège, D., H. Armleder, M. Waterhouse, and T. Goward. 2001. A pilot test of silvicultural systems for northern caribou winter range: lichen response. B.C. Min. For., Res. Br., Victoria, B.C. Work. Pap. 56. http://www.for.gov.bc.ca/hfd/pubs/docs/wp/Wp56.htm

Miège, D., T. Goward, M. Waterhouse, and H. Armleder. 2001. Impact of partial

cutting on lichen diversity in lodgepole pine forests on the Chilcotin Plateau of British Columbia. B.C. Min. For., Res. Br., Victoria, B.C. Work. Pap. 55. http://www.for.gov.bc.ca/hfd/pubs/docs/wp/Wp55.htm

Waterhouse, M., N. Daintith, and O. Steen. 2001. Itcha–Ilgachuz alternative silvicultural systems project: microclimate, planted stock, and natural regeneration. B.C. Min. For., Cariboo Forest Region, Extension Note 35. http://www.for.gov.bc.ca/rsi/research/cextnotes/extnot35.htm

Wei, X., W. Lui, M.,Waterhouse and H. Armleder. 2000. Simulations on impacts of different management strategies on long-term site productivity in lodgepole pine forests of the central interior of British Columbia. Forest Ecology and Management 133: 217–229.

Youds, J., J. Young, H. Armleder, M. Folkema, M. Pelchat, R. Hoffos, C. Bauditz, and M. Lloyd. 2002. Cariboo-Chilcotin Land Use Plan: northern caribou strategy. Cariboo Mid-coast Interagency Management Committee. Special Report. Williams Lake, B.C. http://srmwww.gov.bc.ca/car/planning/cclup/cari_strategy/reports/cari_2002_rpt/cari_main.html

Project Website

Forest Ecosystem Research Network of Sites (FERNS). Natural Resources Canada. Canadian Forest Service. http://www.pfc.cfs.nrcan.gc.ca/ecology/ferns/itcha/index_e.html

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